

The operation of hardware, the design of software, the accuracy of data or the correspondence of data with the real world. Data may be unreliable if it is entered incorrectly or if it becomes outdated.

**Categories of computer errors and failures:**

**1. problems for individuals**

- Usually in their role as consumers.
- Who are incorrectly identified by inaccurate law enforcement databases.

**2. system failures**

- Affecting large numbers of people and/or costing large amounts of money.

**3. safety-critical applications**

- Where people may be injured or killed.

**Problems for individuals:**

- Billing Errors lack of test for inconsistencies and inappropriate amounts.
- Database accuracy problems incorrect information resulting in wrongful treatment or acts.

**Causes**

- Large population.
- Human common sense not part of automated processing.
- Overconfidence in the accuracy of data from a computer.
- Errors on data entry.
- Information not updated or corrected.
- Lack of accountability for errors.

**System failures:**

- Communications: Telephone, online and broadcast services.
- Business: Inventory and management software.
- Financial: stock exchange, brokerages, banks, etc..
- Transportation: Reservation, ticketing and baggage handling.

**Causes**

- Insufficient testing and debugging time.
- Significant changes in specifications(during and after project begun)
- Overconfidence in system.
- Mismanagement of project.

**Safety-Critical Applications:**

- Military
- Power plants
- Aircraft
- Trains
- Automated Factories
- Medicine

- Others

**Causes**

- Overconfidence.
- Lack of override features
- Insufficient testing.
- Sheer complexity of system.
- Mismanagement.

**Case study: therac-25**

The therac-25 was a software controlled radiation-therapy machine used to treat people with cancer.

- Over dosage of radiation
- Normal dosage is 100-200 rads.
- It is estimated that 13,000 and 25,000 rads were given to six people.
- Three of the six people died.

**Multiple causes**

- Poor safety design
- Insufficient testing and debugging.
- Software errors
- Lack of safety interlocks
- Overconfidence
- Inadequate reporting and investigation of accidents.

**Increasing Reliability & Safety****Computer systems fail because**

- The job they are doing is difficult.
- The job is done poorly.

**Adding the reliability issue**

- Developers and users exhibit overconfidence in the system. Refused system software may not work in different environments.

**Professional Techniques**

- Follow good software practices.
- Exhibit professional responsibility at all levels of development and use.
- Construct well-designed user interface.
- Take human factors into account.
- Include built-in redundancy.
- Incorporate self-checking where appropriate.
- Follow good testing principles and techniques.

**Law and Regulation**

- Criminal and civil penalties: To recover loss from faulty or unsafe systems.
- Liability and Civil laws: To provide incentives to produce
- Warranties: To guarantee a certain level of quality.
- Federal or state Regulations: To protect the public.
- Database Accuracy Enforcement : To protect the public from inaccurate information maintained by private companies and government.
- Mandatory licensing of Software Developers: To ensure proper training, competency, and continuing education.